Effects of *Saccharomyces cerevisiae* fermentation product supplementation on the acute-phase response during bovine respiratory disease in neonatal calves' respiratory disease

**Abstract**

Bovine respiratory disease complex (BRDC) is a multi-pathogenic interaction often resulting in lower respiratory tract infections in cattle. BRDC commonly presents as a primary viral infection, followed by a secondary bacterial infection, resulting in clinically severe disease that can be fatal in neonatal calves. There has been research on the calves' immune response to the individual infections, but little has been done to study the immune response to a viral-bacterial co-infection. Supplementation with *Saccharomyces cerevisiae* fermentation products (SCFP) has shown to have positive effects on performance, health, and immunity in cattle. A recent study demonstrated that supplementation of neonatal calves with the SCFP products, NutriTek and SmartCary, modulated the immune response in calves and improved the outcome of an experimental bovine respiratory syncytial viral (BRSV) infection. This study’s objective is to evaluate the effects of SCFPs on the acute phase response through quantitative gene expression for inflammatory cytokines: TNF-alpha, IL-1, and IL-6 from tissue using qPCR in a viral and bacterial co-infection in neonatal calves and correlate the findings with immune function and performance. Current results suggest that with a minimal increase in cytokine response, treated calves cleared the infection(s) with a better success rate following peak viral load.

**Methods**

- 28 Holstein x Angus calves enrolled in the study and were organized by weight and randomly divided into 2 treatment groups: SCFP (+) and SCFP (-).
- Collected baseline samples followed by sample collection every 2 days post-viral infection until necropsy (D0, D2, D4, …).
- Baseline liver biopsy collected prior to viral infection for quantitative analysis following the study.
- Calves received primary viral infection with aerosolized ~10^5 TCID50 BRSV strain 375.
- On 5th post-viral infection, calves received bacterial infection via intratracheal inoculation of ~10^4 colony forming units of P. multocida type A3.
- Collected liver biopsy during necropsy for quantitative analysis following the study.
- RT-qPCR analysis of nasal swab for viral load analysis.
- RT-qPCR analysis of pre-infection liver biopsy for baseline cytokine expression analysis.
- RT-qPCR analysis of necropsy liver biopsy for final cytokine expression analysis.

**Cytokine Expression**

**Pre v. Post TNF-A**

**Pre v. Post IL-6**

**Pre v. Post IL-1B**

**Conclusions**

- SCFP is known to modulate the immune response in neonatal calves.
- SCFP (+) calves experienced, on average, lower viral load throughout the course of the study as compared to SCFP (-) calves.
- There was not a strong correlation between clinical scores and SCFP (-) calves, but SCFP (+) calves generally experienced an increase in average clinical scores as cytokine expression increased.
- Gross pathology scores improved slightly with an overall, qualitative, increase in cytokine expression.
- Overall, SCFP (+) calves maintained lower nasal viral load and higher cytokine expression compared to the SCFP (-) peak viral load.
- SCFP modulates the acute-phase response.
- In the future, targeting the acute-phase response may alleviate BRS in neonatal calves.

**References**


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